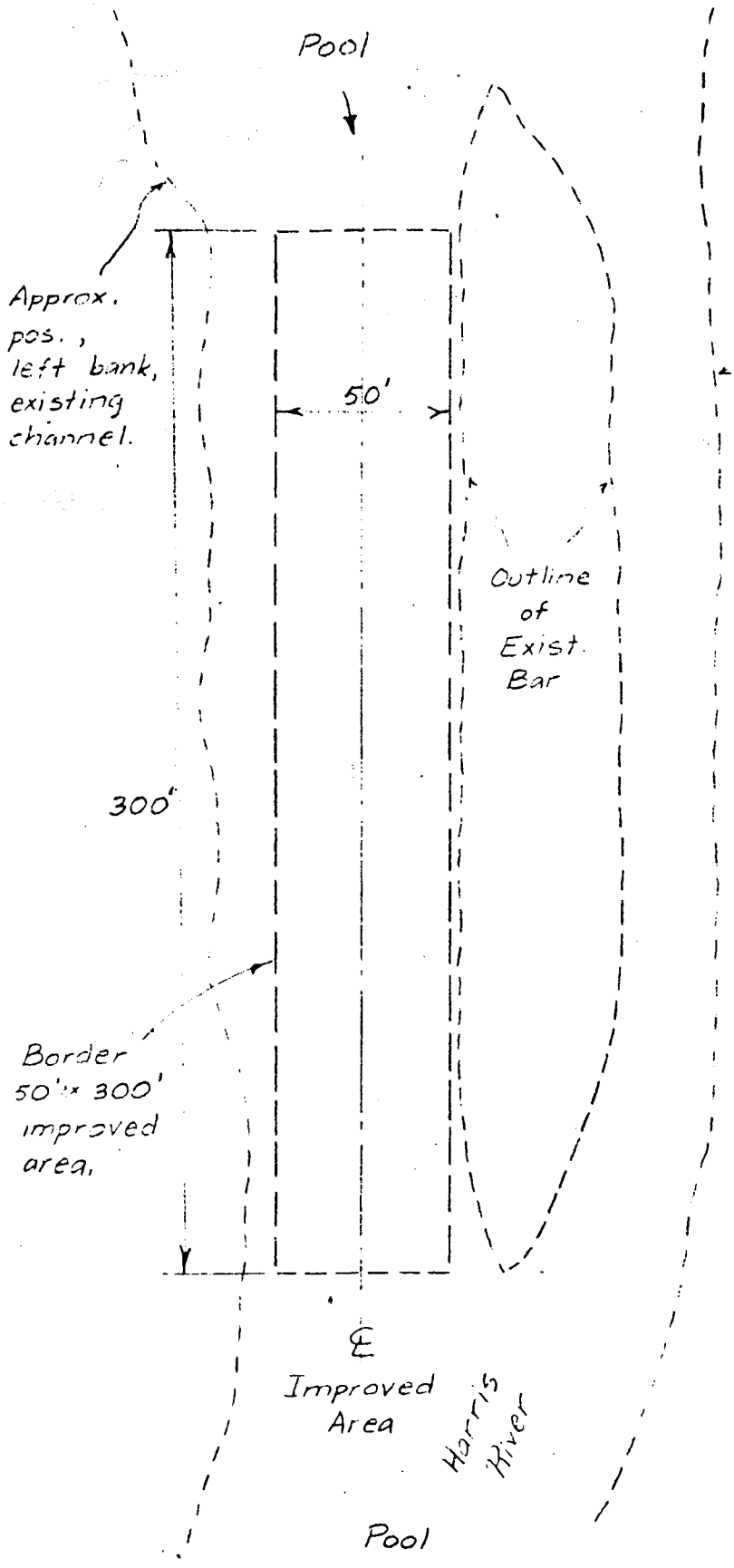
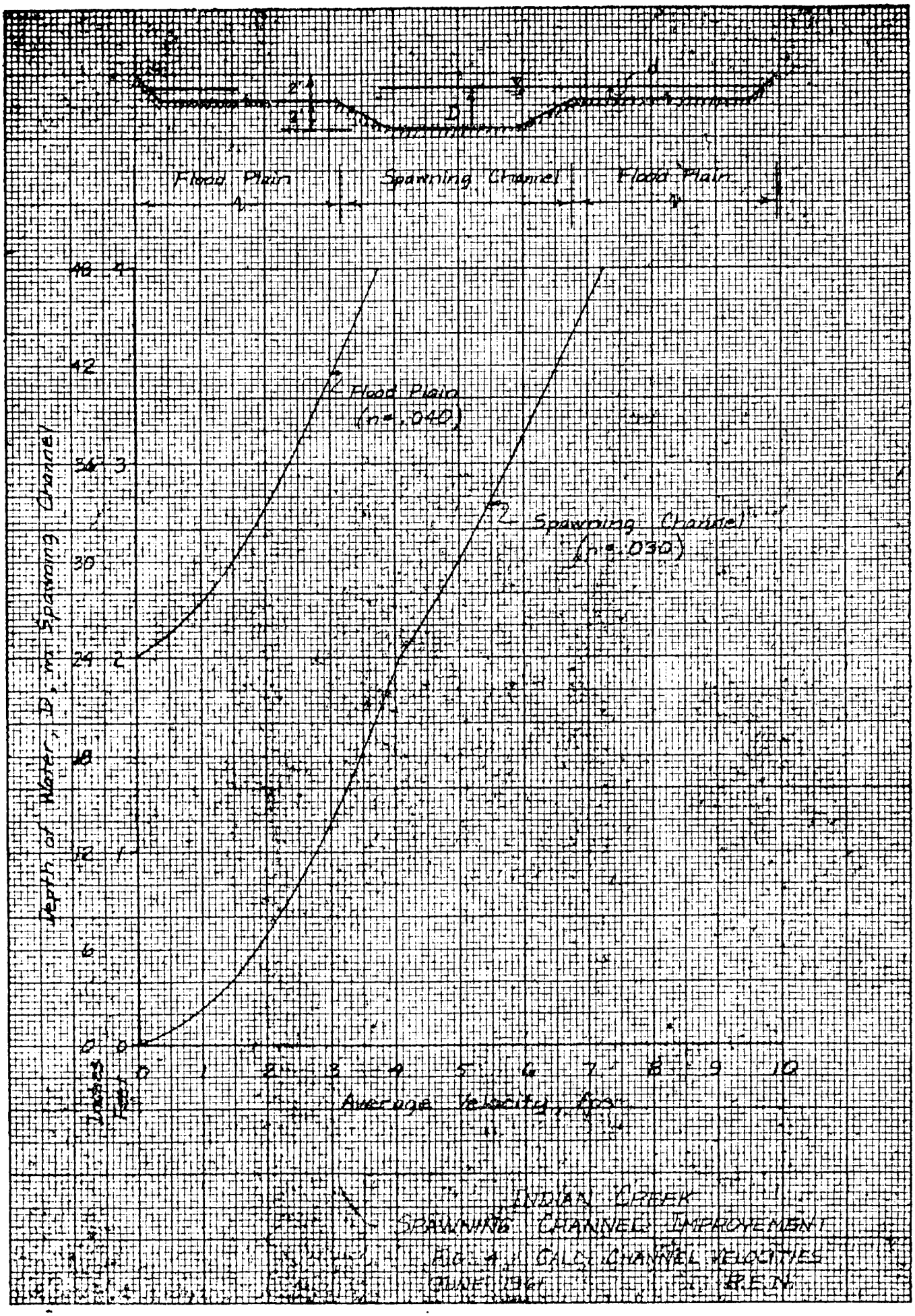


Note:
Existing grade ≅ 0.02 %, final slope = 0.02 %, on ℄ improved area, Sta. 0+00 to Sta. 3+00. Use replacement gravel from adjacent bar to restore surface of improved area to its original elevation.

HARRIS RIVER
SPAWNING CHANNEL IMPROVEMENT
FIG. 5: PLAN LAYOUT
JUNE 1961 Scale: 1" = 50' R.E.N.



INDIAN CREEK
SPAWNING CHANNEL IMPROVEMENT
FIG. 4 CALC. CHANNEL VELOCITIES
JUNE 1967 R.E.N.

The calculated discharge-velocity data are listed in Table I. The calculated rating curve is plotted in Figure 3, and the calculated velocities in Figure 4. It is noted that at a peak flow of 1,000 cfs, the calculated average velocity in the spawning channel is twice that in the flood plain area.

At a flow of 5 cfs, the calculated depth in the spawning channel is just below 4 inches, and the average velocity is about 1.4 fps. These figures satisfy the design criteria. Flows of less than 100 cfs will be confined to the low-flow channel.

TABLE I

Hydraulic Characteristics, Spawning Channel

Water Depth D, Inches	A sq. ft.	R ft	V fps	Q cfs
4	3.55	0.31	1.43	5.1
6	5.50	0.45	1.84	10.1
12	12.00	0.83	2.76	33.0
18	19.50	1.16	3.46	67.0
24	28.00	1.48	4.07	114.0
30	37.00	2.02	5.00	185.0
36	46.00	2.52	5.79	266.0
42	55.00	3.01	6.50	358.0
48	64.00	3.50	7.22	461.0

Hydraulic Characteristics, Flood Plain

Water Depth d, Inches	R ft	V fps	q cfs/ft	Q cfs
6	0.5	1.49	0.75	58
12	1.0	2.36	2.36	184
18	1.5	3.09	4.64	362
24	2.0	3.75	7.50	585

Combined Discharges, Water in Flood Plain

Water Depth d, Inches	Spawning Channel Q, cfs	Flood Plain Q, cfs	Total Q cfs
6	185	58	243
12	266	184	450
18	358	362	720
24	461	585	1046

Vertical controls are to be carried to 0.1 foot. All excavation and grading with the exception of the finished spawning channel will be done with a bulldozer.

Spawning Channel

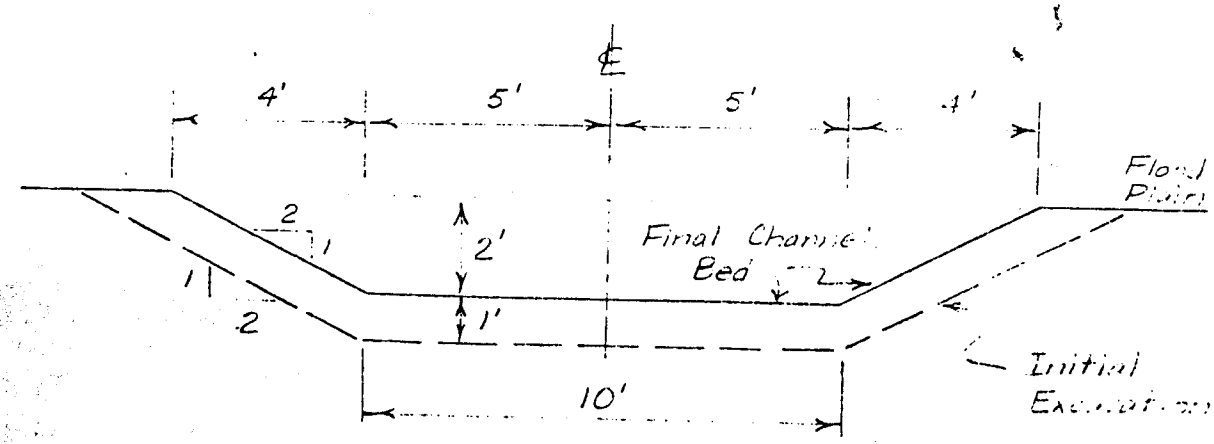
The final graded trapezoidal section will have dimensions detailed in Figure 2.

Initial excavation of the spawning channel is to be carried out to one foot below grade, as indicated. This is to be done after the flood plain has been excavated to grade. Gravel from the initial 3-foot deep cut for the spawning channel is to be stock-piled on the flood plain at the top of the spawning channel bank. Gravel composition tests indicate that approximately 50 percent by volume of the original bed gravel lies within the 3/4-to-6-inch range. By working an end loader equipped with a 3/4-yard bucket with a portable mechanical vibrating screen, the excavated gravel will be sorted, and gravel within the 3/4-to-6-inch range will be used to form the final spawning channel bed. The three-foot center cut is expected to provide the volume of gravel required for the spawning channel.

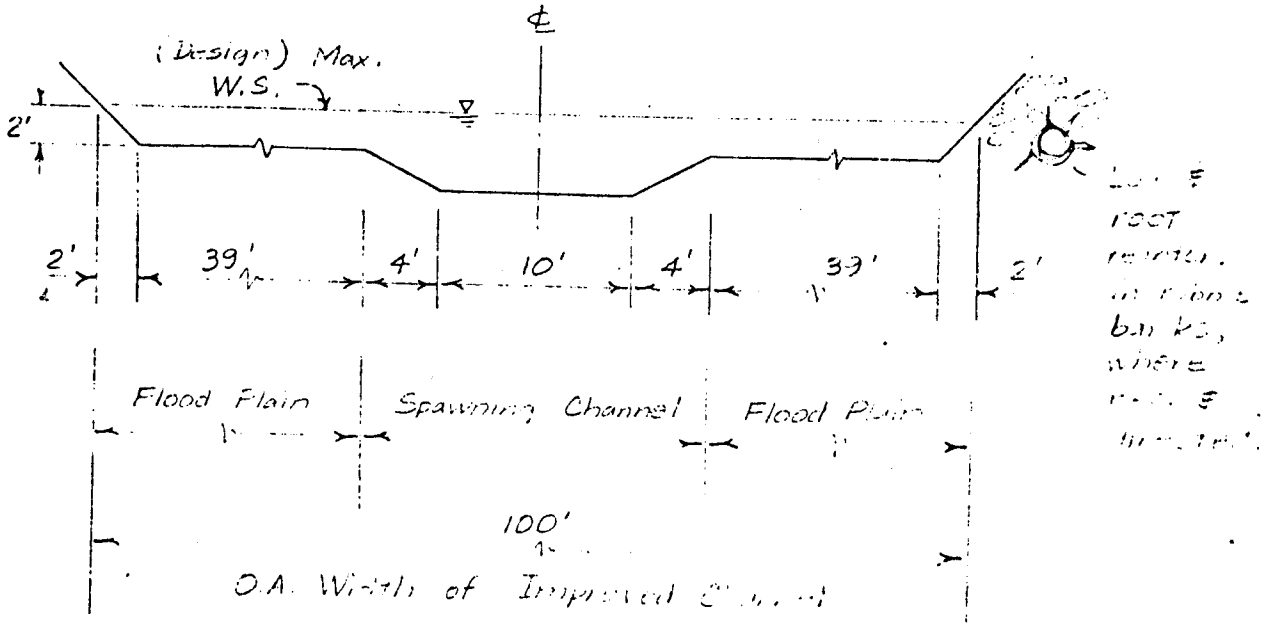
Final grading of the spawning channel is to be done with the bucket of the end loader. Excess materials, outside the size range placed in the improved bed, are to be spread out on the surface of the flood plain. Large cobbles will be placed at the top of the spawning channel bank to stabilize it. The 1 : 2 side slopes are known to be stable for stream gravel.

The 1,200-foot spawning channel is to contain a number of 2 x 12 planks, buried on edge and spanning the 10-foot wide channel bed, with their top edges at the channel invert, and oriented normal to the center-line. These planks are to be at 50-foot spacings, for the purpose of assuring complete exchange between oxygenated surface water and intra-gravel water every 50 feet. Location of these boards will be made during final construction.

A relatively large proportion of sand and fine gravels is present in the existing stream above Sta. 15+00. To prevent these finer materials from being carried into the improved spawning area during high flow, a detention pool (sand trap) is to be located between Sta. 14+00 and Sta. 15+00. The downstream end of this pool is to be stabilized by a log, buried transverse to the channel, and anchored by large rubble.



Detail of Spawning Channel



Cross - Section of Channel

INDIAN CREEK
SPAWNING CHANNEL IMPROVEMENT
FIG. 2 : CROSS - SECTION DETAILS
JUNE 1961 M.E.M.

Within the low flow (spawning) channel the stream bed gravel will be sorted, and the bed to a depth of one foot will be composed of gravels between a 3/4" minimum size and 6" maximum size.

The most critical condition for stream-flow design is the low tide state; consequently, tidal effects are not considered in the design, which is for unretarded fresh-water flow. Additionally, ice effects are not included in the calculations. Although it is recognized that hydraulically uniform flow will occur only over short lengths of the improved channel, for simplicity flow calculations are based upon application of the uniform flow Manning formula.

GENERAL DESIGN AND CONSTRUCTION FEATURES - INDIAN CREEK

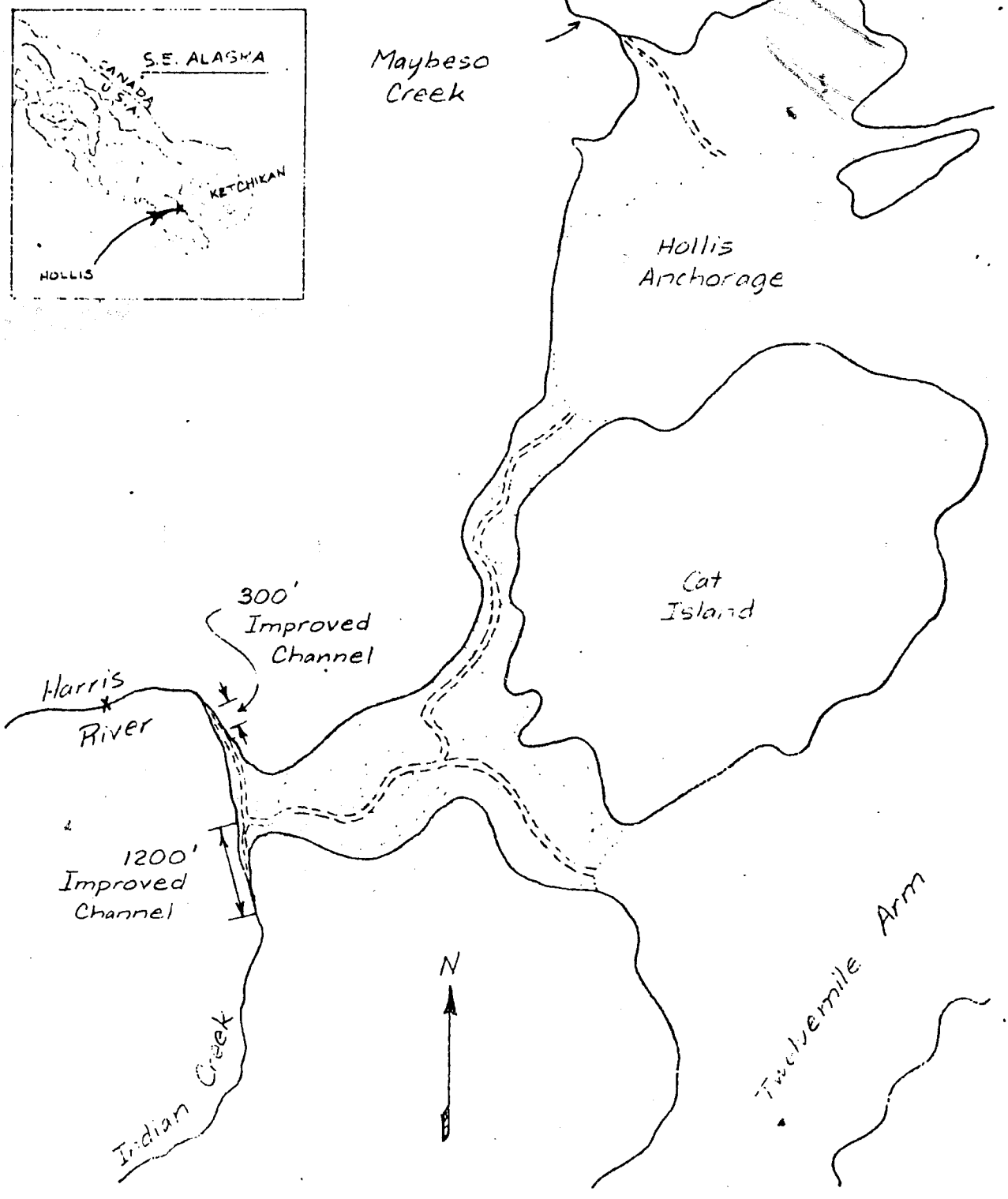
General Design

The general plan and profile layout of the improved channel are shown in Figure 1; cross-section details in Figure 2.

The lower 1,200-foot (Sta. 0+00 to Sta. 12+00) straight reach will contain the finished spawning channel, constructed according to details shown in Figure 2. Starting at Sta. 15+00 and working upstream, there will be a single curve in the approach channel; this is dictated by the existing stream channel and natural banks. The curve is laid out for ease of construction, as shown in Figure 1. Changes in the flood plain (high flow channel) width are dictated by natural bank constrictions. The channel will continue upstream from Sta. 17+00 and fair into the approaching natural channel boundaries as determined during field construction. A low-flow channel approximating the shape of the finished 1,200-foot spawning channel will be constructed on the centerline of the relocated stream to the upstream end of the artificially widened flood plain - approximately Sta. 20+00.

Between Sta. 14+00 and Sta. 17+00 the improved channel will cut off an existing bend in the channel. The concave (left) bank to be constructed at this bend will be reinforced with logs from nearby log jams, as well as large trees which must be downed in the clearing operations. (See paragraph 3, page 4.)

The slope of the 1,200-foot downstream reach will be 0.4%; this slope matches the existing average gradient, and is selected to provide adequate channel excavation to supply gravel fill with a minimum of haul. All gravel for bed and banks will be obtained from excavation in the channel. Elevations are referenced to a series of temporary bench marks, established in the field. The channel will be continued downstream from Sta. 0+00, cutting through a bar at the mouth of Indian Creek, with the invert of the final spawning channel to be at the grade of the bottom of Harris River at its confluence with Indian Creek. Upstream from Sta. 12+00, channel slopes are to be laid out in the field to meet the specified grade at Sta. 12+00 and fair into the existing steeper gradient upstream.


S.E. ALASKA
CANADA
U.S.A.
KETCHIKAN
HOLLIS
Maybeso Creek
Hollis Anchorage
Cat Island
300' Improved Channel
Harris River
1200' Improved Channel
Indian Creek
Tuckemile Arm
N
Gaging Station
0
2000
4000 Ft.
Scale